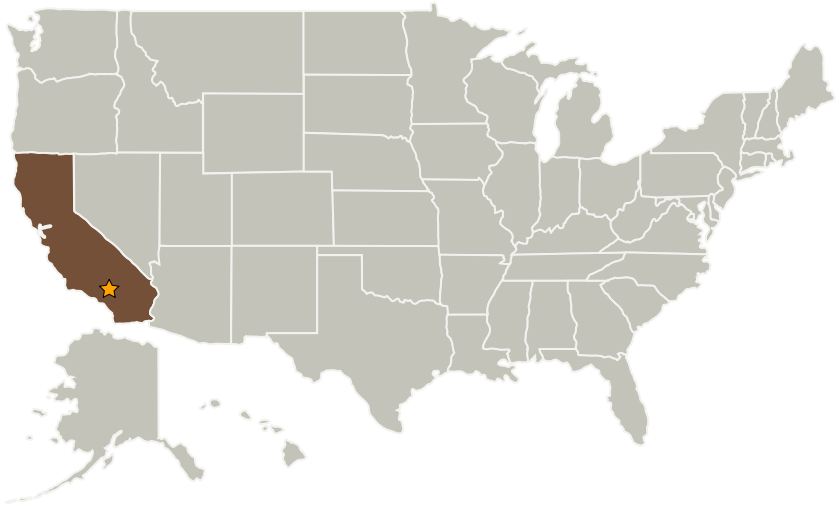
Numerical Algorithms for Steady and Unsteady Multi-Disciplinary Simulation of Flight Vehicles, Phase I

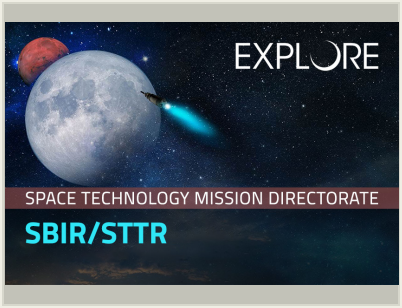
Completed Technology Project (2004 - 2005)

Project Introduction

A new multidisciplinary software environment ('MUSE') will be developed for the simulation of flight vehicles, drawing on the results of recent research on very fast algorithms, performed at Stanford University under Professor Antony Jameson's guidance. This new technology will be merged with Intelligent Aerodynamics' finite element methology implemented in the product FASTPLANE. This code, which uses multigrid acceleration techniques and is fully parallelized, can already perform^Msteady-state simulations of complete aircraft in less than 5 minutes on a 16 processor Beowulf cluster. The synergy resulting from the technology transfer will lead to a new level of capability for the simulation of both steady and unsteady flows, thus providing the platform needed to couple additional disciplines into an advanced multidisciplinary tool for aero-structural and thermal analysis. It can also provide the platform for a new generation of design-optimization software using the adjoint methodology developed by Antony Jameson and his collaborators during the last decade. Moreover, with further advances in the performance of computer hardware that can be anticipated, real time simulation of flight vehicles should in the future be feasible with this new software. This would provide a powerful new tool to support flight-testing.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Intelligent Aerodynamics	Supporting Organization	Industry	Menlo Park, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Antony Jameson

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL